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(54)考案の名称　プッシュスイッチ用可動接点

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(72)考案者　鈴木　克則　静岡県藤枝市田中2－7－16

(71)出願人　ミサキ電子工業株式会社　静岡県静岡市末広町110番地

(74)代理人　弁理士　鈴江　武彦　外3名

(57)実用新案登録請求の範囲

内部に第1スイッチ用の第1固定接点と第2スイッチ用の第2固定接点とコモン接点とを設けたスイッチケース内に前記コモン接点に接触させた状態で設けられ、押圧操作により弾性変形してクリック作用をもつて前記第1固定接点に接触するとともに、この第1スイッチがオンした後さらに押圧操作されることによりさらに弾性変形してクリック作用をもつて前記第2固定接点に接触するプッシュスイッチ用可動接点であつて、

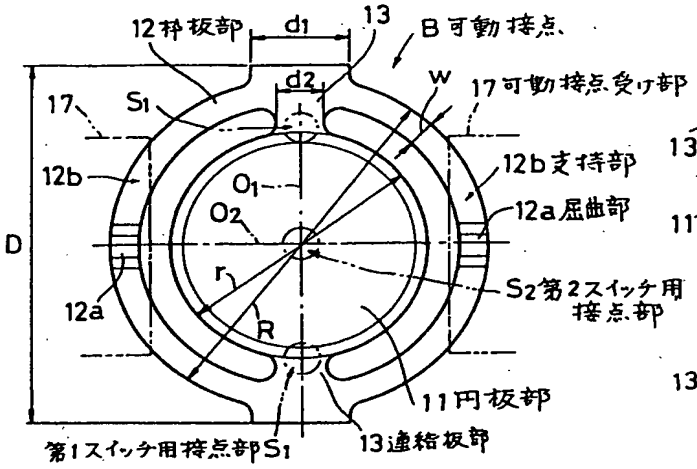
押圧操作される円板部と、この円板部の外周を間隙を存して囲む環状の枠板部と、前記円板部の中心を通る直径線上において前記枠板部の内周縁と前記円板部の外周縁とをつなぐ一対の連結板部とからなる形状の1枚の金属板からなり、かつ前記円板部は上脹らみに彎曲する皿状に形成し、前記枠板部はその全周が枠板部外周縁から内周縁に向かつて上向きに傾斜する皿ばね状に形成し、前記一対の連結板部はそれぞれ前記枠板部から前記円板部に向かつて上向きに傾斜させるとともに、前記枠板部の両側部にそれぞれ、前記円板部の中心を通りかつ前記直径線と直交する直線と交差する部分を上方に突き出した屈曲部を形成し、前記枠板部の両側部をそれぞれ前記スイッチケース内の一対の可動接点受け部に載置される支持部とし、かつこの支持部の少なくとも一方を、上記一対の可動接点受け部の少なくとも一方の可動接点受け面に設けられる前記コモン接点とこの接触部とするとともに、前記一対の連結板部の少なくとも一方と前記円板部とのつながり部を、前記枠板部全周の下向き傾斜状態への反転により前記第1固定接点に接触する第1スイッチ用接点部とし、前記円板部の中心部をこの円板部の下脹らみ状態へ反転により前記第2固定接点に接触する第2スイッチ用接点部としたことを特徴とするプッシュスイッチ用可動接点。

図面の簡単な説明

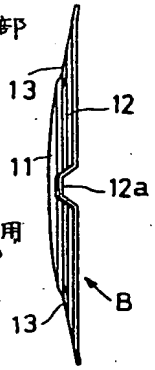
第1図～第10図はこの考案の一実施例を示したもので、第1図は可動接点の平面図、第2図および第3図は同じくその側面図および正面図、第4図は可動接点の荷重－ストローク特性図、第5図および第6図は二段クリック型プッシュスイッチの縦断正面図および縦断側面図、第7図および第8図は同じく第1スイッチ・オン状態の縦断正面図および縦断側面図、第9図および第10図は同じく第2スイッチ・オン状態の縦断正面図および縦断側面図である。第11図は従来の可動接点の平面図、第12図および第13図は同じくその側面図および正面図、第14図および第15図は従来の可動接点を用いた二段クリック型プッシュスイッチの縦断正面図および縦断側面図、第16図および第17図は同じく第1スイッチ・オン状態の縦断正面図および縦断側面図、第18図および第19図は同じく第2スイッチ・オン状態の縦断正面図および縦断側面図である。

B……可動接点、11……円板部、12……枠板部、12a……屈曲部、12b……支持部(コモン接点接触部)、13……連結板部、S_1……第

1スイッチ用接点部、S_2……第2スイッチ用接点部、14……スイッチケース、15……第1固定接点、16……第2固定接点、17……可動接点受け部、18……コモン接点、19……上カバー、20……防塵シート。



第 1 図



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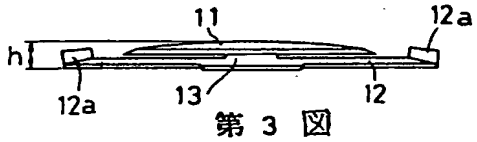

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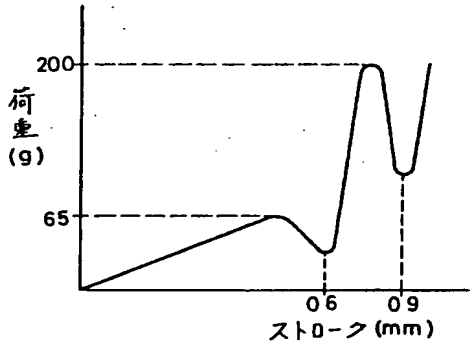
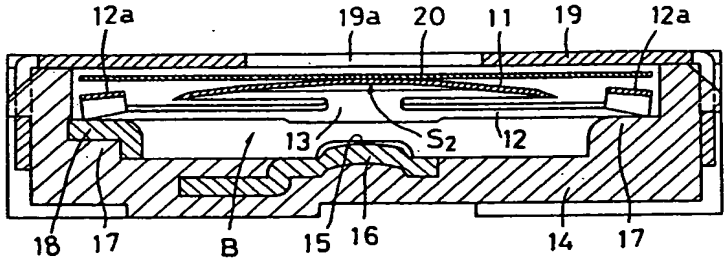
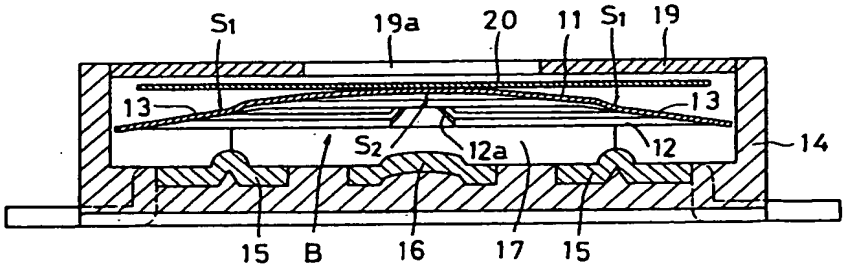


第 4 図



第 5 図



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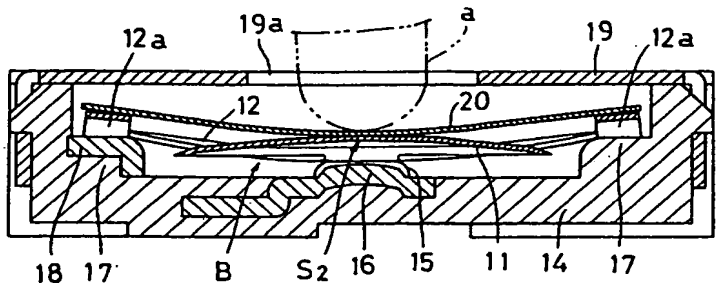

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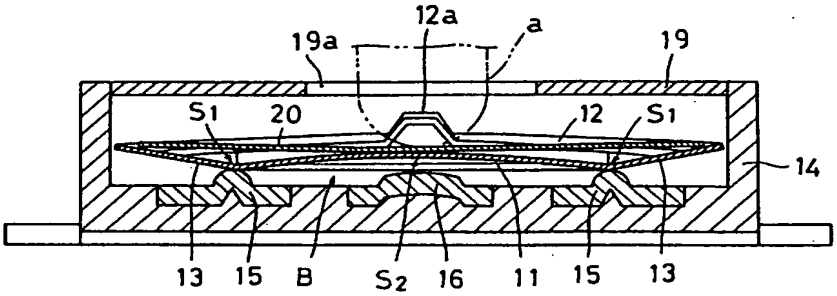

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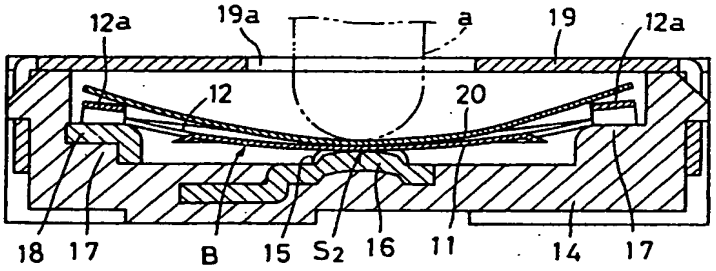

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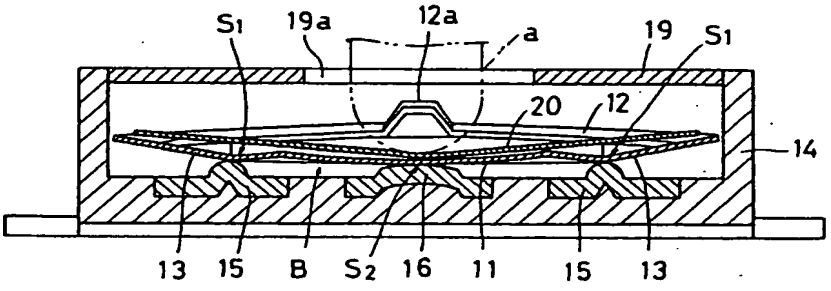

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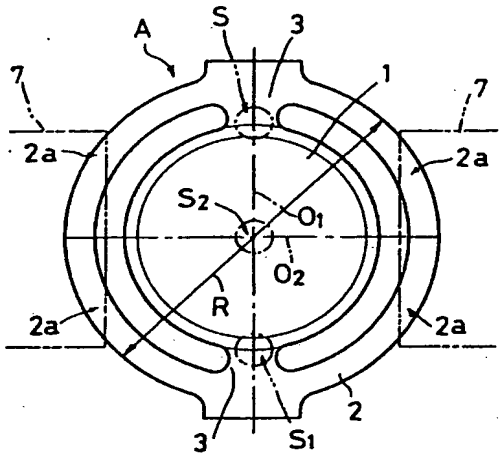
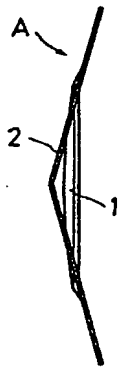
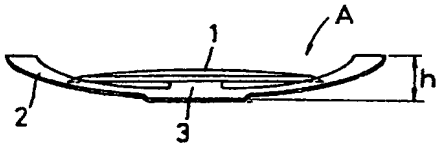


第 11 図



第 12 図



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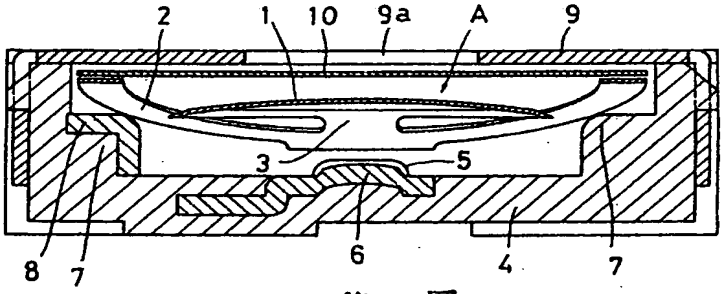

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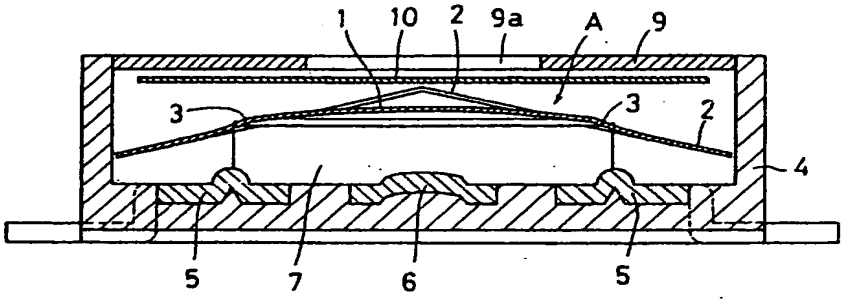

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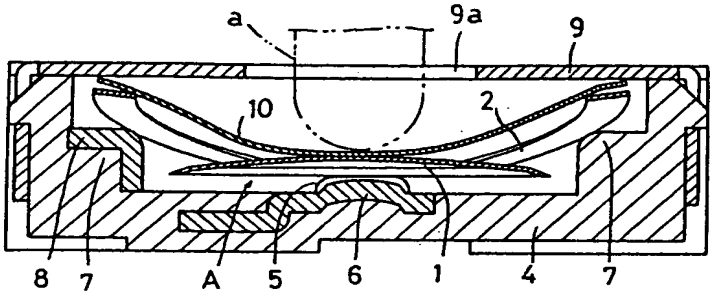
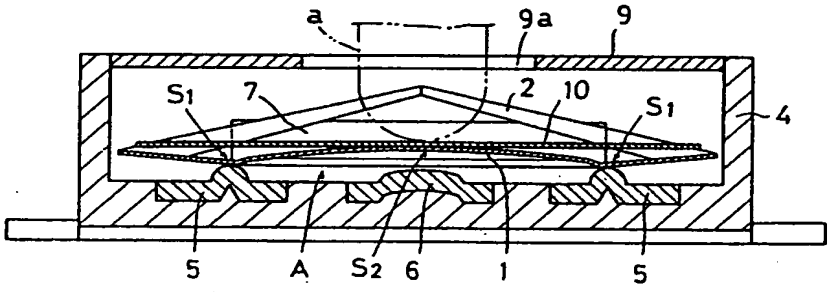
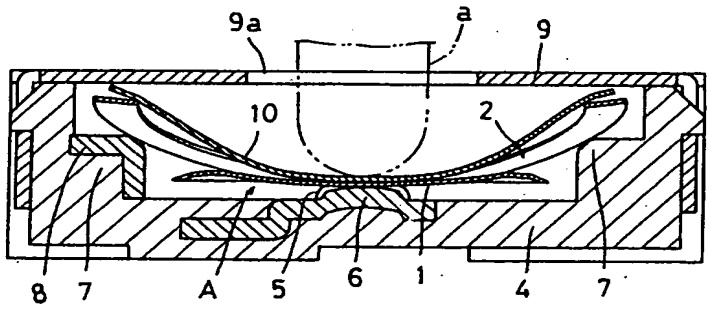


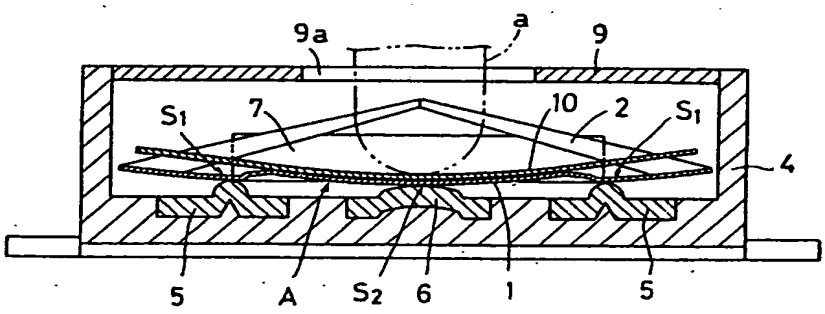
第16 図



第17 図



第18 図



第19 図

(19) Japan Patent Office (JP) (11) Utility Model Laid-Open

(12) Japanese Utility Model Laid-Open (U) No. H2-102629

(51) Int.Cl.[5]	Identification Symbol	Internal File No.	(43) Date of publication of application:
H 01 H 13/64		8729-5G	August 15, 1990
13/48		7926-5G	

Request for Examination: Requested Number of Claims: 1 (pages in all)

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(54) Title of the Device: MOVABLE CONTACT FOR PUSH SWITCH

(21) Application No. H1-9820

(22) Date of filing: February 1, 1989

(72) Inventor: Suzuki, Katsunori 7-16, Tanaka 2-chome, Fujieda-shi, Shizuoka

(71) Applicant: MISAKI Electronics co., ltd. 110, Suehiro-cho, Shizuoka-shi, Shizuoka

(74) Agent: Patent Attorney, Suzue, Takehiko and three others

SPECIFICATION

1. Title of the Device

MOVABLE CONTACT FOR PUSH SWITCH

2. Utility Model Claim

A movable contact for a push switch that is provided in a switch case, in which first fixed contacts for a first switch, a second fixed contact for a second switch, and a common contact are provided, in contact with the common contact and is elastically deformed by pressing operation to come into contact with the first fixed contacts with a click action and, after this first switch is turned on, further elastically deformed by further pressing operation to come into contact with the second fixed contact with a click action, characterized in that

the movable contact for a push switch is made of one sheet of a metal plate having a shape formed by a disc portion subjected to pressing operation, an annular frame plate portion that surrounds an outer periphery of this disc portion with a gap present between the outer periphery and the frame plate portion, and a pair of coupling plate portions that connect an inner peripheral edge of the frame plate portion and an outer peripheral edge of the disc portion on a diameter line passing a center of the disc portion, the disc portion is formed in a dish shape curving to bulge upward, an entire periphery of the frame plate portion is formed in a coned disc spring shape inclining upward from an outer peripheral edge of the frame plate portion to the inner peripheral edge thereof, the pair of coupling plate portions are inclined upward from the frame plate portion to the disc portion, respectively, bent portions, portions of which crossing a straight line that passes the center of the disc portion and is orthogonal to the diameter line project upward, are formed on both side portions of the frame plate portion, both the side portions of the frame plate portion are set as support portions placed in a pair of movable contact receiving portions in the switch case, respectively, at least one of the support portions is set as a contact portion

with the common contact provided on a movable contact receiving surface of at least one of the pair of movable contact receiving portions, a connecting portion of at least one of the pair of coupling plate portions and the disc portion is set as a contact portion for the first switch that comes into contact with the first fixed contacts by a depression of the entire periphery of the frame plate portion into a downward inclined state, and the center of the disc portion is set as a contact portion for the second switch that comes into contact with the second fixed contact by a depression of this disc portion into a downward-bulged state.

3. Detailed Description of the Device

[Field of the Invention]

The present device relates to a movable contact for a push switch used in a two-stage click type push switch that is adapted to turn on a first switch and a second switch with a time difference and obtain click actions at times when the first switch and the second switch are turned on, respectively.

[Prior Art]

As a push switch, there is one that includes a first switch and a second switch and turns on the first switch and the second switch with a time difference. The push switch of this type is built in, for example, a shutter unit of a camera having an auto-focus function and is used. When a user presses a shutter button to apply pressing operation to the push switch, first, the first switch is turned on and an auto-focus mechanism operates. Subsequently, when the second switch is turned on, a shutter mechanism comes into an operation state and, when the camera is focused on a subject, a shutter operates.

As the push switch, there are a push switch in which a first switch is turned on without a click action and only a second switch is turned on with a click action and a two-stage click type push switch in which a first switch and a second switch are turned on with click actions, respectively. As the latter two-stage click type push switch, the push

switch having the constitution described in Japanese Utility Model Laid-Open No. 58-148833 is known. In this push switch, two movable contacts are arranged at upper and lower two stages in a switch case, a first switch is constituted by the movable contact at the upper stage and the movable contact at the lower stage, and a second switch is constituted by the movable contact at the lower stage and a fixed contact provided on an inner bottom surface of the switch case. The movable contact at the upper stage comes into contact with the movable contact at the lower stage with a click action. The movable contact at the lower stage also comes into contact with the fixed contact with a click action.

However, since the two movable contacts are arranged at the upper and lower two stages in the switch case, this two-stage click type push switch has a problem in that thickness of the entire switch is considerably large and, moreover, assembly of the switch is complicated.

Therefore, recently, it has been considered constituting a two-stage click type push switch using one piece of movable contact that has a contact portion for a first switch and a contact portion for a second switch.

Figs. 11 to 13 show a movable contact that has been conventionally devised as a movable contact that has the contact portion for the first switch and the contact portion for the second switch. This movable contact is an improvement of the movable contact described in Japanese Utility Model Laid-Open No. 56-64619.

This movable contact A is manufactured by pressing one sheet of metal plate and assumes a shape formed by a disc portion 1 that is subjected to pressing operation, an annular frame plate portion 2 that surrounds an outer periphery of this disc portion 1 with a gap present between the outer periphery and the frame plate portion 2, and a pair of coupling plate portions 3 that connect an inner peripheral edge of the frame plate portion 2 and an outer peripheral edge of the disc portion 1 on a diameter line O_1 passing the center of the disc portion 1. The disc portion 1 is formed in a dish shape curving to bulge upward. The frame plate portion 2 is folded into two in a V shape with a straight line O_2,

which passes the center of the disc portion 1 and is orthogonal to the diameter line O_1, as a top. The pair of coupling plate portions 3 are inclined upward from the frame plate portion 2 to the disc portion 1 by the V-shaped folding of the frame plate portion 2, respectively. In this movable contact A, parts of inclined portions on both sides of the top in both side portions folded in a V shape of the frame plate portion 2 are set as support portions 2a placed on a pair of movable contact receiving portions 7 in a switch case described later, respectively. One of the support portions 2a is set as a portion coming into contact with the common contact. Connecting portions of the pair of coupling plate portions 3 and the disc portion 1 are set as contact portions S_1 for a first switch, respectively, and the center of the disc portion 1 is set as a contact portion S_2 for a second switch. Thus, a two-stage click type push switch using this movable contact A has a constitution described below.

Figs. 14 and 15 show the two-stage click type push switch using the movable contact A. Reference numeral 4 in the figures denotes a switch case made of synthetic resin. On an inner bottom surface of this case 4, a pair of first fixed contacts 5 for the first switch located in the front and the rear of the center of the inner bottom surface and a second fixed contact 6 for the second switch located in the center are provided. On both sides in the case 4, a pair of movable contact receiving portions 7 projecting upward from the inner bottom surface of the case 4 are integrally formed. A common contact 8 shared by the first switch and the second switch is provided on an upper surface of one movable contact receiving portion 7. This common contact 8 is provided at a level identical with a level of the upper surface of the other movable contact receiving portion 7. The movable contact A is set in the case 4 in a state in which both the side portions folded in a V shape of the frame plate portion 2 are placed on the movable contact receiving portions 7 in the support portions 2a and one support portion 2a is in contact with the common contact 8. Reference numeral 9 denotes an upper cover made of a metal plate that covers the upper surface of the case with both side portions thereof locked to the case 4. An opening 9a

for subjecting the center of the disc portion 1 of the movable contact A to pressing operation is provided in the center of this upper cover 9. Reference numeral 10 denotes a dust proof sheet made of a synthetic resin film provided on the movable contact A with both the side portions thereof supported by the top of the frame plate portion 2. The disc portion 1 of the movable contact A is subjected to pressing operation from the opening 9a of the upper cover 9 via the dust proof sheet 10.

An operation of the movable contact A in this two-stage click type push switch will be explained. In an initial state, as shown in Figs. 14 and 15, this movable contact A is in contact with only the common contact 8 and is spaced apart from and opposed to the first fixed contacts 5 and the second fixed contact 6. When the disc portion 1 of the movable contact A is pressed by a pressing operation member (see Figs. 16 to 19) "a" in order to turn on the push switch, first, the disc portion 1 is pushed down while keeping the state in which the disc portion 1 curves to bulge upward. In accordance with the pushdown of the disc portion 1, the coupling plate portions 3 inclined upward from the frame plate portion 2 to the disc portion 1 bend in the connecting portions with the disc portion 1 (the part of the contact portions S_1 for the first switch) and gradually lie flat. When the coupling plate portions 3 gradually lie flat, the frame plate portion 2 bent in a V shape is pushed outward by the coupling plate portions 3 to be deformed to expand and open and the connecting portions of the coupling plate portions of the frame plate portion 2 are deformed to lie flat together with the coupling plate portions 3. In accordance with the deformation of the frame plate portion 2, a restoring force of the frame plate portion 2 increases. Thus, the restoring force of the frame plate portion 2 acts as a resistance against the pushdown of the disc portion 1 until the coupling plate portions 3 come into a horizontal state. However, when the coupling plate portions 3 go beyond the horizontal state, the restoring force of the frame plate portion 2 does not act as a resistance force against the pushdown of the disc portion 1 any more. The connecting portion of the coupling plate portion of the frame plate portion 2 suddenly depresses to a downward state

together with the coupling plate portions 3. As shown in Figs. 16 and 17, the connecting portions of the coupling plate portions 3 and the disc portion 1, that is, the contact portions S_1 for the first switch come into contact with the first fixed contacts 5 with a click action. The first switch is turned on (the common contact 8 and the first fixed contacts 5 become conductive via the movable contact A). When the disc portion 1 of the movable contact A is further pressed, since the disc portion 1 is in a state in which the contact portions S_1 for the first switch of the connecting portions with the coupling plate portions 3 are received by the first fixed contacts 5, a pressing force acts only on the disc portion 1. In this case, since the disc portion 1 curves in the upward-bulged state, in the early stage of pressing, the disc portion 1 is elastically deformed to be recessed downward in the center while showing a high resistance against the pressing force. However, when the disc portion 1 is recessed downward to a certain degree, the disc portion 1 cannot stand the pressing force and suddenly depresses to the downward-bulged state. As shown in Figs. 18 and 19, the contact portion S_2 for the second switch in the center of the disc portion 1 comes into contact with the second fixed contact 6 with a click action. The second switch is turned on (the common contact 8 and the second fixed contact 6 become conductive via the movable contact A). When the pressing force of the disc plate 1 is released, the disc portion 1 is restored to the upward-bulged state by elasticity of the disc portion 1. First, the second switch is turned off. Subsequently, the frame plate portion 2 is restored to the V-shape bent state at the early stage. The coupling plate portions 3 are also restored to the upward inclined state by the restoration of the frame plate portion 2. The first switch is turned off.

The movable contact A causes a click action when the movable contact A comes into contact with the first fixed contacts 5 to turn on the first switch and when the movable contact A comes into contact with the second fixed contact 6 to turn on the second switch. If the movable contact A is used, it is possible to reduce the number of movable contacts of the two-stage click type push switch to one and improve reduction in thickness and

assemblability of the two-stage click type push switch.

[Problems to be Solved by the Device]

However, in the conventional movable contact A, a click action is given to turn-on of the first switch by bending the frame plate portion 2 of the movable contact A in a V shape. Thus, in the case of a movable contact having a diameter (an external shape of the frame plate portion 2) R of 7.7 mm, height (height from the lower end to the top of the frame plate portion 2 bent in a V shape) of the movable contact A is as large as about 1.0 mm. Therefore, there is a problem in that, although thickness of the push switch is small compared with the push switch in which two movable contacts are provided at upper and lower two stages, the thickness is considerably large compared with the push switch that uses one movable contact having a click action only when the second switch is turned on.

The device has been devised in view of the circumstances described above and it is an object of the device to provide a movable contact for a push switch that can reduce height of a contact to reduce thickness of the push switch, although a contact portion for a first switch and a contact portion for a second switch are formed in one contact and both the contact portions are brought into contact with a fixed contact with a click action.

[Means for Solving the Problems]

A movable contact for a push switch of the device is a movable contact for a push switch made of one sheet of a metal plate having a shape formed by a disc portion subjected to pressing operation, an annular frame plate portion that surrounds an outer periphery of this disc portion with a gap present between the outer periphery and the frame plate portion, and a pair of coupling plate portions that connect an inner peripheral edge of the frame plate portion and an outer peripheral edge of the disc portion on a diameter line passing a center of the disc portion, the disc portion is formed in a dish shape curving to bulge upward, an entire periphery of the frame plate portion is formed in a coned disc spring shape inclining upward from an outer peripheral edge of the frame plate portion to the inner peripheral edge thereof, the pair of coupling plate portions are inclined upward

from the frame plate portion to the disc portion, respectively, bent portions, portions of which crossing a straight line that passes the center of the disc portion and is orthogonal to the diameter line project upward, are formed on both side portions of the frame plate portion, both the side portions of the frame plate portion are set as support portions placed in a pair of movable contact receiving portions in the switch case, respectively, at least one of the support portions is set as a contact portion with a common contact provided on a movable contact receiving surface of at least one of the pair of movable contact receiving portions, a connecting portion of at least one of the pair of coupling plate portions and the disc portion is set as a contact portion for a first switch that comes into contact with first fixed contacts by a depression of the entire periphery of the frame plate portion into a downward inclined state, and the center of the disc portion is set as a contact portion for the second switch that comes into contact with a second fixed contact by a depression of this disc portion into a downward-bulged state.

[Operation]

In the movable contact for a push switch of the device, instead of bending a frame plate portion in a V shape to give a click action to turn-on of a first switch as in the past, an entire periphery of the frame plate portion is inclined upward from an outer peripheral edge of the frame plate portion to an inner peripheral edge thereof to make this frame plate portion similar to an outer peripheral portion of a coned disc spring and a contact portion for the first switch of a connecting portion of a coupling plate portion and a disc portion is brought into contact with first fixed contacts with a click action by a depression of the entire periphery of the frame plate portion to a downward inclined state. According to this movable contact, height of the entire contact is height obtained by adding up height of the frame plate portion, an entire periphery of which is inclined in a coned disc spring shape, rising height of the coupling plate portion inclined upward from the frame plate portion to the disc portion, and height of the disc portion formed in a dish shape curving to bulge upward. Thus, compared with the conventional movable contact in which the

frame plate portion is bent is a V shape, it is possible to reduce the height of the entire contact. Therefore, if the movable contact of the device is used in the two-stage click type push switch, it is possible to reduce thickness of this push switch.

[Embodiment]

An embodiment of the device will be hereinafter explained with reference to the drawings.

Figs. 1 to 3 show a movable contact in this embodiment. This movable contact B is manufactured by pressing one sheet of metal plate and assumes a shape formed by a disc portion 11 that is subjected to pressing operation, an annular frame plate portion 12 that surrounds an outer periphery of this disc portion 11 with a gap present between the outer periphery and the frame plate portion 12, and a pair of coupling plate portions 13 that connect an inner peripheral edge of the frame plate portion 12 and an outer peripheral edge of the disc portion 11 on a diameter line O_1 passing the center of the disc portion 4. The disc portion 11 is formed in a dish shape curving to bulge upward. An entire periphery of the frame plate portion 12 is formed in a coned disc spring shape inclined upward from the outer peripheral edge of the frame plate portion to the inner peripheral edge thereof. The pair of coupling plate portions 13 are inclined upward from the frame plate portion 12 to the disc portion 11 at substantially the same angle as an inclination angle of the frame plate portion 12, respectively, by forming the frame plate portion 12 in the coned disc spring shape. Bent portions 12a of a trapezoidal shape, portions of which crossing a straight line O_2 that passes the center of the disc portion 11 and is orthogonal to the diameter line O_1 locally project upward, are formed on both side portions of the frame plate portion 12, respectively. The bent portions 12a are provided in order to form the frame plate portion 12 in a coned disc spring shape and allow extension of the frame plate portion 12 in the diameter line O_1 direction. A projecting amount of the bent portions 12a is set to be smaller from the outer peripheral edge of the frame plate portion to the inner peripheral edge thereof. Dimensions of the respective portions of the movable contact B are as

follow: $D = 8.3$ mm, $R = 7.7$ mm, $w = 0.6$ mm, $r = 5.2$ mm, $d_1 = 2.0$ mm, and $d_2 = 1.0$ mm.

In this movable contact B, both side portions of the frame plate portion 12 where the bent portions 12a are formed are set as support portions 12b placed on a pair of movable contact receiving portions 17 in a switch case described later, respectively. One of the support portions 12b is set as a portion coming into contact with the common contact. Connecting portions of the pair of coupling plate portions 13 and the disc portion 11 are set as contact portions S_1 for a first switch, respectively, and the center of the disc portion 11 is set as a contact portion S_2 for a second switch. A two-stage click type push switch using this movable contact B has a constitution described below.

Figs. 5 and 6 show the two-stage click type push switch using the movable contact B. Reference numeral 14 in the figures denotes a switch case made of synthetic resin. On an inner bottom surface of this case 14, a pair of first fixed contacts 15 for the first switch located in the front and the rear of the center of the inner bottom surface and a second fixed contact 16 for the second switch located in the center are provided. On both sides of the case 14, a pair of movable contact receiving portions 17 projecting upward from the inner bottom surface of the case 14 are integrally formed. A common contact 18 shared by the first switch and the second switch is provided on an upper surface of one movable contact receiving portion 17 at a level identical with a level the upper surface of the other movable contact receiving portion 17. The movable contact B is set in the case 14 in a state in which both the side portions of the frame plate portion 12 where the bent portions 12a are formed are placed on the movable contact receiving portions 17, respectively, and one support portion 12b is in contact with the common contact 18. Reference numeral 19 denotes an upper cover made of a metal plate that covers the upper surface of the case with both side portions thereof locked to the case 14. An opening 19a for subjecting the center of the disc portion 11 of the movable contact B to pressing operation is provided in the center of this upper cover 19. Reference numeral 20 denotes

a dust proof sheet made of a synthetic resin film provided on the movable contact B with the center of the dust proof sheet 20 supported by the disc portion 11. The disc portion 11 of the movable contact B is subjected to pressing operation from the opening 19a of the upper cover 19 via the dust proof sheet 20.

An operation of the movable contact B in this two-stage click type push switch will be explained. In an initial state, as shown in Figs. 5 and 6, this movable contact B is in contact with only the common contact 18 and is spaced apart from and opposed to the first fixed contacts 15 and the second fixed contact 16. When the disc portion 11 of the movable contact B is pressed by a pressing operation member (see Figs. 7 to 10) "a" in order to turn on the push switch, first, the disc portion 11 is pushed down while keeping the state in which the disc portion 11 curves to bulge upward. In accordance with the pushdown of the disc portion 1, a portion not supported by the movable contact receiving portions 17 of the frame plate portion 12 (a portion floating in the air) is slightly deformed to curve and the coupling plate portions 13 inclined upward from the frame plate portion 12 to the disc portion 11 bend in the connecting portions with the disc portion 11 (the part of the contact portions S_1 for the first switch) and gradually lie flat. When the coupling plate portions 13 gradually lie flat, the frame plate portion 12 is pushed outward by the coupling plate portions 13 to extend in the diameter line O_1 direction while deforming to expand and open the bent portions 12a thereof. The entire periphery of the frame plate portion 2 is deformed to lie flat from the upward inclined state by a downward pressing force that acts on the connecting portion of the coupling plate portion. Since the frame plate portion 12 is a portion of a coned disc spring shape, the frame plate portion 12 is deformed to lie flat while showing a high resistance against the pressing force from the coupling plate portions 13. However, when the frame plate portion 12 lies flat to a certain degree, the entire periphery of the frame plate portion 12 cannot stand the pressing force and suddenly depresses to the downward-bulged state. Consequently, the coupling plate portions 13 also suddenly depress to the downward state. As shown in Figs. 7 and 8, the

contact portions S_1 for the first switch of the connecting portion of the coupling plate portions 13 and the disc portion 11 comes into contact with the first fixed contacts 15 with a click action. The first switch is turned on. Turn-on of the second switch is the same as that of the push switch that uses the conventional movable contact. When the disc portion 11 of the movable contact B is further pressed, the disc portion 11, the contact portions S_1 for the first switch of the connecting portions with the coupling plate portions 13 of which is received by the first fixed contacts 15, suddenly depresses to the downward-bulged state when the disc portion 11 cannot stand the pressing force. As shown in Figs. 9 and 10, the contact portion S_2 for the second switch in the center of the disc portion 11 comes into contact with the second fixed contact 16 with a click action. The second switch is turned on. When the pressing force of the disc portion 11 is released, the disc portion 11 is restored to the upward-bulged state by elasticity thereof. The second switch is turned off. Subsequently, the frame plate portion 12 is restored to the initial state. The coupling plate portions 13 are also restored to the upward inclined state by the restoration of the frame plate portion 12. The first switch is turned off. Fig. 4 shows a load (pressing force)-to-stroke characteristic of the movable contact B.

In the movable contact B, instead of bending the frame plate portion in a V shape to give a click action to the first switch on as in the conventional movable contact, the entire periphery of the frame plate portion 12 is inclined upward from the outer peripheral edge of the frame plate portion to the inner peripheral edge thereof to form the frame plate portion 12 in a shape similar to the outer peripheral portion of the coned disc spring, and the contact portions S_1 for the first switch in the connecting portions of the coupling plate portions 13 and the disc portion 11 are given a click action by a depression into a downward inclined state of the entire periphery of the frame plate portion to come into contact with the first fixed contacts 15. According to this movable contact A, height h of the entire contact is a sum of height of the frame plate portion 12, the entire periphery of which is inclined in a coned disc shape, rising height of the coupling plate portions 13

inclined upward from the frame plate portion 12 to the disc portion 11, and height of the disc portion 11 formed in a dish shape curving to bulge upward (h = about 0.6 mm in the case of a movable contact having a diameter, that is, an external shape R of the frame plate portion 12 of 7.7 mm). Thus, compared with the conventional movable contact (height h = about 1.0 mm), the frame plate portion of which is bent in a V shape, it is possible to reduce height of the entire contact. Therefore, if this movable contact is used in the two-stage click type push switch, it is possible to reduce thickness of this push switch. Thickness of the two-stage click type push switch using the movable contact B in the embodiment is about 2.5 mm and thickness of the two-stage click type push switch using the conventional movable contact is about 3.0 mm. If the movable contact B in the embodiment is used, it is possible to significantly reduce thickness of a push switch about 20% compared with the conventional one. Since the frame plate portion 12 of the movable contact B in the embodiment is formed in a coned disc spring shape, the movable contact B has high durability against repetition of depression deformation compared with the conventional movable contact, the frame plate portion of which is bent in a V shape. The movable contact B has a working life equal to or longer than 30000 times.

In the embodiment, one of the support portions 12b placed on both the side portions of the frame plate portion 12, that is, the pair of movable contact receiving portions 17 in the switch case 14 is set as a portion coming into contact with the common contact. However, in the movable contact B, the support portions 12b on both the sides of the frame plate portion 12 thereof may be set as portions coming into contact with the common contact, respectively. In that case, the common contacts 18 only have to be provided on the pair of movable contact receiving portions 17 in the switch case 14. In the embodiment, the connecting portions of the pair of coupling plate portions 13 and the disc portion 11 are set as the contact portions S_1 for the first switch, respectively. However, the contact portion S_1 for the first switch may be set in any one of the connecting portions (the connecting portion of one of the pair of coupling plate portions 13 and the

disc portion 11). In that case, the first fixed contacts 15, with which the contact portion S_1 for the first switch comes into contact, and a projected portion that receives the connecting portion of the other coupling plate portion 13 and the disc portion 11 when the contact portion S_1 for the first switch comes into contact with the first fixed contacts 15 only have to be provided on the inner bottom surface of the switch case 14 at an identical level.

[Advantages of the Device]

In the movable contact for a push switch of the device, instead of bending the frame plate portion in a V shape to give a click action to the first switch on as in the past, the entire periphery of the frame plate portion is inclined upward from the outer peripheral edge of the frame plate portion to the inner peripheral edge thereof to form the frame plate portion in a shape similar to the outer peripheral portion of a coned disc spring, and the contact portions for the first switch in the connecting portions of the coupling plate portion and the disc portion are given a click action by a depression into a downward inclined state of the entire periphery of the frame plate portion to come into contact with the first fixed contacts. Thus, it is possible to reduce height of the entire contact compared with the conventional movable contact. Therefore, if the movable contact of the device is used in a two-stage click type push switch, it is possible to reduce thickness of the push switch.

4. Brief Description of the Drawings

Figs. 1 to 10 show an embodiment of the device. Fig. 1 is a plan view of a movable contact, Figs. 2 and 3 are a side view and a front view thereof, Fig. 4 is a load-stroke characteristic graph of the movable contact, Figs. 5 and 6 are a longitudinal sectional front view and a longitudinal sectional side view of a two-stage click type push switch, Figs. 7 and 8 are a longitudinal sectional front view and a longitudinal sectional side view in a first switch on state thereof, and Figs. 9 and 10 are a longitudinal sectional front view and a longitudinal sectional side view in a second switch on state thereof. Fig.

11 is a plan view of the conventional movable contact, Figs. 12 and 13 are a side view and a front view thereof, Figs. 14 and 15 are a longitudinal sectional front view and a longitudinal sectional side view of a two-stage clock type push switch using the conventional movable contact, Figs. 16 and 17 are a longitudinal sectional front view and a longitudinal sectional side view in a first switch on state thereof, and Figs. 18 and 19 are a longitudinal sectional front view and a longitudinal sectional side view in a second switch on state thereof.

B: Movable contact, 11: Disc portion, 12: Frame plate portion, 12a: Bent portions, 12b: Support portions (Common contact portions), 13: Coupling plate portions, S_1: Contact portions for first switch, S_2: Contact portion for second switch, 14: Switch case, 15: First fixed contacts, 16: Second fixed contact, 17: Movable contact receiving portions, 18: Common contact, 19: Upper cover, 20: Dust proof sheet.

Agent Patent Attorney, Suzue, Takehiko

FIG. 1

11: DISC PORTION

12: FRAME PLATE PORTION

12A: BENT PORTION

12B: SUPPORT PORTION

13: COUPLING PLATE PORTION

17: MOVABLE CONTACT RECEIVING PORTION

B: MOVABLE CONTACT

S1: CONTACT PORTION FOR FIRST SWITCH

S2: CONTACT PORTION FOR SECOND SWITCH

FIG. 4

荷重：LOAD

ストローク：STROKE